AF
IFW

In the Application of: Kenneth J. Ouimet	Date: 03 March 2009
Serial Number: 10/735,080	Group Art Unit: 4137
Filed: 12 December 2003	Examiner: Parker, Brandi P
Title: *"Method and Computer Program for Field Spectrum Optimization"*	Attorney Docket No: 2297-020

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop: Appeal, COMMISSIONER FOR PATENTS, P.O. Box 1450, Alexandria, VA 22313-1450: on 3 Mar. 2009.

Signature

3 Mar. 2009
Date of Signature

Mail Stop Appeal
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF

Dear Sir:

This Brief is filed pursuant to a Notice of Appeal dated 20 January 2009 in the matter of the above-identified application.

Table of Contents

Real Party in Interest

The real party in interest in the present application, solely for purposes of identifying and avoiding potential conflicts of interest by board members due to working in matters in which the member has a financial interest, is SAP AG. SAP AG. is the assignee of record of the present application.

Related Appeals and Interferences

Appellant is aware of no related appeals, interferences, and/or other proceedings relevant to this discussion.

Status of Claims

Claims 1-23, of which claims 1, 17, and 21 are independent claims, are presented herein. Claims 1-23 have been rejected, and claims 1-23 are on appeal.

Appendix A provides a clean copy of all claims on appeal.

Status of Amendments

No amendments have been filed subsequent to the rejections set forth in a final Office Acton dated 22 September 2008.

Summary of Claimed Subject Matter

Independent claims 1, 17 and 21, and dependent claims 11-14, 22 and 23 are under review. In the following discussion, the text of independent claims 1, 17 and 21, and of dependent claims 11-14, 22 and 23 is presented. Exemplary reference numbers in parentheses follow the name of each item in the text. Bolded descriptions in brackets indicate the exemplary relevant Figure(s) and specification paragraph(s). Specification paragraph(s) numbers are taken from the published application, 2006/0106656A1. The paragraph numbers given to the published application differs from those filed in the originally filed application, as additional paragraph numbers were used in the published application than was originally filed. It is to be understood that other portions of the specification not cited herein may also provide examples of embodiments of elements of the claimed subject matter. It is also to be understood that the indicated examples are merely examples, and the scope of the claimed subject matter includes alternative embodiments and equivalents thereof. References herein to the specification are thus intended to be exemplary and not limiting.

Independent Claim 1

Claim 1: In a planning model (112) characterizing an enterprise, a method (200) **(e.g., discussed in the specification on pages 11-14, paragraphs [0052]-[0059], pages 15-18, paragraphs [0061]-[0068], page 21, paragraph [0077], and illustrated in FIG. 2)** of computing decisions for a set of decision variables (125) comprising:

generating (206) a planning function (122) describing said planning model (112), said planning function (122) depending upon said set of decision variables (125); **(e.g., discussed in the specification on page 15, paragraph [0062] and illustrated in FIG. 2)**

separating (222) said planning function (122) into independent planning functions, each of said independent planning functions (400) depending upon different ones of said set of decision variables (125); **(e.g. discussed in the specification on pages 17-18, paragraphs [0066]-[0067], illustrated in FIG. 2)**

independently optimizing (400) each of said independent planning functions to obtain said decisions for said different ones of said set of decision variables (125); and **(e.g., discussed in the specification on page 18, paragraph [0068] and illustrated in FIG. 2, and as explained on pages 18-20, paragraphs [0069]-[0076], and illustrated in FIG. 4)**

presenting (228) an outcome (500) of said optimizing operation (400), said outcome (500) indicating said obtained decisions (602). **(e.g., discussed in the specification on page 21, paragraph [0077] and illustrated in FIG. 2)**

Dependent Claim 11

Claim 11: A method as claimed in claim 1 wherein said planning model (112) incorporates a primary objective of said enterprise, and said method further comprises:

defining (202) a primary objective function (124) describing said primary objective, said primary objective function (124) including said set of decision variables (125), and said generating operation (206) incorporating said primary objective function (124) within said planning function (122); **(e.g., discussed in the specification on page 12, paragraph [0054] and pages 15, paragraph [0062])**

determining (216) a coupling between said decision variables (125) in said primary objective function (124); **(e.g., discussed in the specification on pages 25-26, paragraph [0086])**

introducing (218) an embedded constraint into said primary objective function (124); and **(e.g., discussed in the specification on pages 26-28, paragraphs [0087]-[0092])**

following said introducing operation, performing (224) said independently optimizing operation (400) to optimize said primary objective function (124) while concurrently satisfying said embedded constraint (804). **(e.g., discussed in the specification on page 27, paragraph [0090])**

Dependent Claim 12

Claim 12: A method as claimed in claim 11 wherein:

said introducing operation (218) comprises:

including (802) an embedded constraint variable for said embedded constraint in said primary objective function (124); and **(e.g., discussed in the specification on page 26, paragraph [0087])**

defining (804) an embedded constraint function to include said embedded constraint variable; **(e.g., discussed in the specification on page 26, paragraph [0088])**

said generating operation (206) comprises constructing said planning function (122) by combining (808) said primary objective function (124) and said embedded constraint function; and **(e.g., discussed in the specification on pages 26-27, paragraph [0089])**

said independently optimizing operation (400) comprises providing said decisions which optimize said primary objective function (124) while concurrently satisfying said embedded constraint function. **(e.g., discussed in the specification on page 27, paragraph [0090])**

Dependent Claim 13

Claim 13: A method as claimed in 12 further comprising:

specifying (810) a plurality of values (902) for a constraint factor (903), said constraint factor (903) being configured to adjust an influence that said embedded constraint has on said planning model (112); and **(e.g., discussed in the specification on pages 28-29, paragraph [0093])**

coupling (806) said embedded constraint function with said constraint factor (903). **(e.g., discussed in the specification on pages 26-27, paragraph [0089])**

Dependent Claim 14

Claim 14: A method as claimed in claim 13 wherein said independently optimizing operation (400) optimizes said independent planning functions for each of said values (902) of said constraint factor (903).). **(e.g., discussed in the specification on page 17, paragraphs [0066]-[0067])**

Independent Claim 17

Claim 17: A computer-readable storage medium (120) containing executable code (112) for instructing a computer (100) **(e.g., discussed in the specification on pages 9-11, paragraphs [0047]-[0051] and illustrated in FIG. 1)** to compute decisions (602) for a set of decision variables (125) of a planning model characterizing an enterprise, said planning model incorporating a primary objective and a strategic objective of said enterprise, and said executable code (112) instructing said computer to perform operations comprising:

defining (202) a primary objective function (124) describing said primary objective, said primary objective function (124) including said set of decision variables (125); **(e.g., discussed in the specification on page 12, paragraph [0054] and illustrated in FIG. 2)**

defining (208) a strategic objective function (126) describing said strategic objective, said strategic objective function (126) including a subset of said decision variables (125); **(e.g., discussed in the specification on page 13, paragraph [0056] and illustrated in FIG. 2)**

generating (206) a planning function (122) describing said planning model, said generating operation (206) incorporating said primary objective function (124) and said strategic objective function (126) within said planning function (122), and said planning function (122) including a non-linear function (116) of one of said decision variables (125); **(e.g., discussed in the specification on page 15, paragraph [0062] and illustrated in FIG. 2)**

separating (222) said planning function (122) into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables (125); **(e.g. discussed in the specification on pages 17-18, paragraphs [0066]-[0067], and illustrated in FIG. 2)**

independently optimizing (400) each of said independent planning functions to obtain said decisions (602) for said different ones of said set of decision variables (125); and **(e.g., discussed in the specification on page 18, paragraph [0068] and illustrated in FIG. 2, and as explained on pages 18-20, paragraphs [0069]-[0076], and illustrated in FIG. 4)**

presenting (228) an outcome (500) of said optimizing operation (400), said outcome indicating said obtained decisions (602). **(e.g., discussed in the specification on page 21, paragraph [0077] and illustrated in FIG. 2)**

Independent Claim 21

Claim 21: A method (200) of computing decisions (600) for a set of decision variables (125) of a planning model (112) characterizing an enterprise, said planning model (112) incorporating a primary objective of said enterprise, said method (200) comprising:

defining a primary objective function (124) describing said primary objective, said primary objective function (124) including said set of decision variables (125); **(e.g., discussed in the specification on page 12, paragraph [0054] and illustrated in FIG. 2)**

generating (206) a planning function (122) describing said planning model (112), said planning function (122) including said primary objective function (124), and said planning function (122) depending upon said set of decision variables (125); **(e.g., discussed in the specification on page 15, paragraph [0062] and illustrated in FIG. 2)**

determining (216) a coupling between said decision variables (125) in said primary objective function (124); **(e.g. discussed in the specification on page 15, paragraph [0063] and illustrated in FIG. 2)**

introducing (218) an embedded constraint into said primary objective function (124); **(e.g. discussed in the specification on page 16, paragraph [0064] and illustrated in FIG. 2)**

separating (222) said planning function (122) into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables (125), said independent planning functions including said embedded constraint; **(e.g. discussed in the specification on pages 17-18, paragraphs [0066]-[0067], and illustrated in FIG. 2)**

independently (400) optimizing each of said independent planning functions to obtain said decisions (600) for said different ones of said set of decision variables (125), said optimizing operation (400) optimizing said primary objective function (124) while concurrently satisfying said embedded constraint; and **(e.g., discussed in the specification on page 18, paragraph [0068] and illustrated in FIG. 2, and as explained on pages 18-20, paragraphs [0069]-[0076], and illustrated in FIG. 4)**

providing (228) said decisions for said different ones of said set of decision variables (125) that optimize said each of said independent planning functions. **(e.g., discussed in the specification on page 21, paragraph [0077] and illustrated in FIG. 2)**

Dependent Claim 22

Claim 22: A method (200) as claimed in claim 21 wherein said generating operation (206) defines said planning function (122) to include a non-linear function (1116) of at least one of said decision variables (125). **(e.g., discussed in the specification on page 32, paragraph [0123] and illustrated in FIG. 11)**

Claim 23: A method as claimed in claim 21 wherein:

said introducing operation (218) comprises:

including (802) an embedded constraint variable for said embedded constraint in said primary objective function (124); and **(e.g., discussed in the specification on page 26, paragraph [0087])**

defining (804) a embedded constraint function to include said embedded constraint variable; **(e.g., discussed in the specification on page 26, paragraph [0088])**

said generating operation (206) comprises constructing said planning function (122) by combining (808) said primary objective function (124) and said embedded constraint function; and **(e.g., discussed in the specification on pages 26-27, paragraph [0089])**

said independently optimizing operation (400) comprises providing said decisions which optimize said primary objective function (124) while concurrently satisfying said embedded constraint function. **(e.g., discussed in the specification on page 27, paragraph [0090])**

Grounds of Rejection to Be Reviewed on Appeal

Claims 1-4, 15 and 22 stand rejected under 35 U.S.C. §102(b) as being anticipated by Elad et al., U.S. Patent No. 5,195,172 (hereinafter Elad). Claims 5-11, and 16-21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Elad et al., in view of Ouimet, U.S. Patent No. 6,308,162 (hereinafter Ouimet). Claims 12-14 and 23 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Elad et al. and Ouimet, in view of Dietrich et al., U.S. Patent No. 5,630,070 (hereinafter Dietrich).

The following grounds of rejection are presented for review:

1: Whether claims 1-4, 15 and 22 are anticipated under 35 U.S.C. §102(b) by Elad et al.

2: Whether claims 5-11, and 16-21 are unpatentable under 35 U.S.C. §103(a) over a combination of Elad et al. and Ouimet.

3: Whether claims 12-14 and 23 are unpatentable under 35 U.S.C. §103(a) over a combination of Elad et al., Ouimet and Dietrich et al.

Arguments

Grounds of Rejection – Claims 1-4, 15 and 22

Independent Claim 1:

Regarding claim 1, the 22 September 2008 Office Action to this application alleges that Elad discloses a method for computing decisions. In particular, this Office Action (page 4) cites a passage in Elad at col. 37, lines 5-9, as a teaching of Appellant's claim 1 limitation of "generating a planning function...depending upon said set of decision variables," as recited in claim 1, with the Examiner reading the Elad reference to a "purely numerical model" as being the claimed "planning function." This Office Action (page 4) further cites a passage in Elad at col. 41, lines 34-39, as teaching of Appellant's claim 1 limitation of "separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables," as recited in claim 1. In this passage, the Examiner reads the Elad reference to "components of the combined objective functions separately" as being the claimed "independent planning functions."

The Office Action (page 4) additionally cites passages in Elad at col. 12, lines 27-35 and col. 40, lines 48-59, as teaching of "independently optimizing each set of said independent planning functions to obtain said decisions for said different ones of said set of decision variables," as recited in claim 1. This Office Action (page 4) also cites a passage in Elad at col. 40, lines 54-59 as teaching of "presenting an outcome of said optimizing operation," as recited in claim 1.

Elad teaches of a method to represent and solve numeric and symbolic problems (title) for accepting user inputs and permitting the user to solve the problem manually or automatically (abstract). In particular, Elad teaches a Problem Solving Engine (PSE) that takes objective and constraint functions that represent a problem and builds a purely numerical model, referred to as the combined objective function, from them to solve the problem (col. 37, lines 5-9). Subsequent to solving the problem, the obtained decisions are presented to the user (col. 40, line 54-59).

The problem solving methodology taught by Elad ultimately provides the user with a set of decision variables deemed as having the values most aligned with objectives and constraints provided by the user (col. 41, lines 9-33). The set of decision variables is created by using "strong" and "weak" methods to determine a "current best" set of decision variables from one set of initial values for the decision variables (col. 40, lines 54-59). One pass through the "strong" and "weak" methods provides a relatively good set of values for the decision variables; however, it may not be the best set of values that can be obtained. In order to better ensure the best possible result, the initial values of the decision variables are changed, and the "strong" and "weak" methods are used again to determine another "current best" (Fig. 15). The likelihood of the best possible result being obtained increases with the number of cycles completed of the "strong" and "weak" methods (col. 40, lines 32-40).

The "weak" methods use the entirety of the decision variables to determine the "best" set of decision variables. First, each of the decision variables is tested to determine what changes would increase the likelihood of a desirable outcome (col. 48, lines 65-66). Once these changes are determined, the changes are implemented in the numerical model, with the changes providing the greatest likelihood of a desirable outcome being implemented first (col. 49, lines 2-16). After each change is made, a determination is made as to whether the result is better than the "current best" already determined (col. 49, lines 16-20).

The computational complexity in using the "weak" method is high, as shown by the fact that there is a threshold value used in the "weak" method to determine how many decision variables can be supported while still computing all option combinations of the variables to determine all possible values for the decision variables (col. 39, lines 10-16). If the number of variables is above this threshold, a shorter, "stop early" version of the method is used, limiting the range of tests done to determine the "best" values for the decision variables (col. 39, lines 12-16). This threshold is set based upon the CPU speed (col. 39, lines 18-19).

Also, there is significant time usage in computing the decision set values using the "weak" method. As the number of decision variables increases, more time is necessary to compute the result (col. 39, lines 21-22).

The "strong" methods use a similar iterative process to the "weak" methods, using information related to the currently used decision variables to determine how to modify the decision variables for the next iteration (col. 56, lines 64-67). These iterative changes are implemented to the numerical model until a gradient of the numerical model is zero, or the outcome does not improve on previous results (col. 57, lines 42-50).

The execution time of the "weak" methods is not as sensitive to the number of decision variables as the "strong" method (col. 39, limes 22-24). However, as discussed above, the computational complexity and execution time of the "weak" methods are also dictated by the number of decision variables being below a set threshold which is determined by the CPU speed.

When the PSE is implementing the changes to the decision variables to determine the "best" value, the changes are propagated throughout the model to any other values that must be changed due to any constructs that were implemented, such as formulas or other triggers (col. 36, lines 64-68).

In connection with the rejection of independent claim 1, Appellant contends that the Office Action improperly used a prior art reference to arrive at an anticipation rejection. As stated in W.L. Gore & Associates v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert denied*, 469 U.S. 851 (1984), "[a]nticipation requires the disclosure in a single prior art reference of each element of the claim under consideration." Elad does not teach each of the elements of independent claim 1, and in fact suggests away from the method taught in claim 1. Consequently, claim 1 is not anticipated by Elad, nor would claim 1 be obvious over Elad.

Second Element: "separating said planning function..."

The Examiner has cited Elad's alleged teaching of creating a "score" that is seen by the user as showing the separation of the planning function into independent planning functions (OA, Paragraph 7b, *citing* col. 41, lines 34-39). However, the "score" is created by using the "components of the combined objective function separately" (col. 41, lines 36-37). Elad further explains the idea of these separate components of the objective function : "that is, the constraint functions alone, and then the objective functions alone" (col. 41, lines 38-39).

Elad does not teach separating a planning function into independent planning functions depending upon different decision variables. The constraint functions and objective functions used to create the "score" are the same constraint and objective functions provided to the PSE by the PRF for the generation of the combined objective function (col. 36, lines 41-47). These functions provide the relationship between the different decision variables that the user believes affects the combined objective function. For example, one component function can be "return := profit – cost" (col. 15, line 26). As these functions provide a set of basic associations between the different decision variables, they are not independent functions depending upon different variables, rather the function depends upon multiple variables. Thus, when Elad teaches to use the original components to create the combined objective function, it teaches away from separating a planning function into independent planning functions.

This is further affirmed by Elad's teaching that the functions need not be combined (col. 37, lines 30-33). Without the creation of the combined objective function, there is no "planning function" to "separate into independent planning functions," however the constraint and objective functions are still available to create a "score." This shows that the functions used for calculating the "scale" are not derived from the combined objective function, and in fact Elad suggests away from the separation of the combined objective function into independent functions. Also, as discussed earlier, the original component functions provide the relationship between the different decision variables, and so are not all independent functions that depend on different decision variables. The "separating" element of Appellant's independent claim 1 results

in individual planning functions that are dependent upon individual decision variables. This separation is not taught by Elad.

Third Element: "independently optimizing each..."

The PSE taught by Elad determines the values for a set of decision variables by changing the value of a decision variable and then determining the outcome changes of the result. This process is repeated over multiple iterations to determine the "best" outcome for the problem (Fig. 15 and col. 40, lines 32-40). In other words, Elad teaches optimization through the use of an "exhaustive search" optimization technique. The "weak" method utilizes a modified version of the "exhaustive search" method, where the user can either choose to use the full "exhaustive search", or to control the time that is used to pass through the "weak" method (col. 40, lines 42-47). The "strong" method uses the gradient search method to determine the results (col. 54, lines 37-39).

For each of these methods, a decision variable is changed, the outcome is determined, and compared to the "current best" to see if the new result is better than the "current best" (col. 40, lines 48-58). When the decision variable is changed, the PSE "uses the Object Hierarchy within the PRF to propagate that change to any other values that need to be changed due to constructs ...." (col. 36, lines 64-68). The dependencies that are implemented are done through the dependency machinery which searches up the object hierarchy to determine which variables must be changed as a result of a first variable being changed (col. 32, lines 6-11). In the instance where one change in the first variable causes multiple changes in the object hierarchy, a propagation algorithm organizes the propagation such that minimal cycles are necessary to ensure all variables are properly changed (col. 32, lines 56-64).

The object hierarchy (shown in Fig. 9a), shows the relationship between the different decision variables. It is a representation of all the variables used in the combined objective function. Elad teaches parsing through the object hierarchy to propagate any changes to any decision variables to create the final values for the decision variables. This teaches away from

independently optimizing independent planning functions, instead using the entirety of the combined objective function to determine the values for decision variables.

Elad teaches that the object hierarchy, that defines the decision variable relationships, is created in the PRF, prior to the combined objective function being created by the PRE (col. 16, lines 11-30). Thus, the objective and constraint functions used to create the combined objective function define the object hierarchy. As a result, even if one using the Elad teaching does not combine the objective and constraint functions to form the combined objective function, and proceeds to solve the problem in the PRF, the same dependency and propagation would be executed to provide a result (col. 19, line48 through col. 20, line 20).

Computational complexity is an issue that Elad does acknowledge exists under its teachings (col. 39, lines 20-24), however the methods used by Elad to address this is not to reduce the complexity of the equation to be solved, but rather to limit the values to be tested. Under Elad, the number of cycles used to determine the "global best" values for the decision variables will be very high. To compute the "current best," one cycle of the "weak" method and possibly one cycle of the "strong" method are used (col. 40, lines 49-53). Multiple "current bests" are compared to determine the "global best" values (col. 41, lines 9-13). The computational complexity of the "weak" method is limited by the CPU speed, and requires more time as the number of decision variables increase, and the computational complexity of the "strong" methods are greater than that of the "weak" methods (col. 39, lines 20-24). Multiple cycles of these highly complex and time consuming computations absorb a large number of resources for an enterprise.

By independently optimizing individual planning functions that are derived from a planning function, the computing time and power needed are reduced (page 18, paragraph [0068]). The methods taught by Elad do not suggest a method of reducing the complexity of the computing process, but rather places a limit on the number of cycles that can be used to determine a "current best" if the number of decision variables are above a set threshold (col. 39, lines 12-16).

Since the elements of Appellant's independent claim 1 have not all been taught by Elad, Appellant respectfully asserts that the 35 U.S.C. §102(b) rejection of claim 1 is improper. In addition, Appellant respectfully asserts that there is no suggestion to modify Elad to conform to the elements of independent claim 1. As discussed earlier, Elad's object hierarchy used to propagate changes in decision variables teaches away from creating independent planning functions to optimize different ones of decision variables. Also, teaching the use of original objective and constraint functions to create a "score" to rate the results, and not separating the combined objective function in order to create independent functions teaches away from separating a planning function into independent planning functions depending upon different ones of decision variables.

Also, Appellant respectfully asserts that claims 2-4 and 15 are allowable for the reasons discussed above in connection with claim 1, as they depend either directly or indirectly from claim 1. Furthermore, Appellant respectfully asserts that claims 5-11 and 16 (rejected under 35 U.S.C. §103(b)) are allowable for the reasons discussed above in connection with claim 1, as they depend either directly or indirectly from claim 1.

Dependent Claim 22:

Regarding claim 22, the 22 September 2008 Office Action to this application has rejected this claim under 35 U.S.C. §102(b), as being anticipated by Elad. Claim 22 is a dependent claim, depending upon independent claim 21 (not claim 1). However, the Office Action has not provided a 35 U.S.C. §102(b) rejection for claim 21, upon which claim 22 depends. Instead, the Office Action summarily concluded that claim 21 was equivalent to claims 1 and 5, which it is not, and acknowledged that Elad failed to teach the limitation of "defining a strategic objective function describing said strategic objective, said strategic objective function including a subset of said decision variables ," as recited in claim 5.

In fact, claim 21 is more similar to claims 1 and 11. The Office Action has acknowledge that Elad failed to teach the limitations of "defining a primary objective function describing said

primary objective, said primary objective function including said set of decision variables, and said generating operation incorporating said primary objective function within said planning function," "determining a coupling between said decision variables in said primary objective function," "introducing an embedded constraint into said primary objective function," and following said introducing operation, performing said independently optimizing operation to optimize said primary objective function while concurrently satisfying said embedded constraint," as recited by claim 11 (OA, Paragraphs 17(f)-17(i),, citing Ouimet col. 2, lines 6-10, 15-27 and 37-42). By extension, Elad failed to teach these limitations of claim 21. Therefore, Appellant respectfully asserts that the 35 U.S.C. §102(b) rejection of claim 22 is improper because claim 22 includes the same limitations discussed above that Elad fails to teach with respect to claim 5 or 11.

Grounds of Rejection – Claims 5-11, and 16-21

Dependent Claim 11:

The 22 September 2008 Office Action to this application alleges that Ouimet teaches a method as claimed in claim 1 wherein said planning model incorporates a primary objective of said enterprise. Appellant assumes that the reference to Ouimet was a clerical mistake, and that Elad was the intended reference in this context, as Elad was applied against independent claim 1. Also, Elad fails to teach of the "separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables," and "independently optimizing each of said independent planning functions to obtain said decisions for said different ones of said set of decision variables," limitations recited in claim 1. Appellant respectfully asserts, as discussed above with respect to independent claim 1, Elad does not teach the elements of independent claim 1, upon which claim 11 depends, nor does Ouimet teach the elements of dependent claim 11, and furthermore, the combination of Elad and Ouimet does not teach the claimed invention, nor is there a suggestion to modify either Elad or Ouimet to obtain the claimed invention.

It is assumed that, although the Examiner has stated that Ouimet teaches a method as claimed in claim 1, the Examiner is reasserting the arguments made under 35 U.S.C. §102(b)

regarding independent claim 1 and Ouimet is alleged to teach the elements that are recited under claim 11.

This Office Action (page 7) cites a passage in Ouimet at col. 2, lines 6-8 as teaching of "defining a primary objective function describing said primary objective, said primary objective function including said set of decision variables, and said generating operation incorporating said primary objective function within said planning function." The Office Action continues on page 7 to cite another passage in Ouimet, at col. 2, lines 8-10 as teaching of "determining a coupling between said decision variables in said primary objective function." Ouimet is also cited, at col. 2, lines 15-27, as teaching of "introducing an embedded constraint into said primary objective function;" and at col. 2, lines 37-42, it is alleged to teach of "...performing said independently optimizing operation to optimize said primary objective function while concurrently satisfying said embedded constraint."

Second Element: "determining a coupling..."

Ouimet teaches representing a primary goal by a primary objective function, where the primary objective function depends on a set of operational variables (col. 2, lines 6-8). The Examiner alleges that the passage in Ouimet stating "[e]ach of the operational variables represents a single operational decision that the user seeks to optimize in order to reach the primary goal" teaches the element of "determining a coupling between said decision variables in said primary objective function" of the claimed invention. Appellant respectfully disagrees, as Ouimet does not teach determining a coupling between decision variables. Rather, it teaches that there is a primary objective function which depends upon a set of decision variables. Primary objectives and strategic objectives are defined, combined into an effective objective function, and solved through simulated annealing (col. 7, lines 9-50).

A coupling need only be determined from the combined function when the function is to be separated into independent functions, a limitation stated in claim 1. This is done so that the coupling can be later broken and the combined function can be separated into individual functions that depend on individual variables (page 27, paragraph [0089]). This issue is not

taught by Ouimet, and there is no suggestion to modify Ouimet to do this, as Ouimet does not separate the effective objective function into independent functions.

Appellant respectfully asserts that that the 35 U.S.C. §103(a) rejection of claim 11 is improper, as neither Elad nor Ouimet teaches of determining a coupling element.

Third Element: "introducing an embedded constraint..."

The third element of claim 11 recites "introducing an embedded constraint into said primary objective function." Column 2, lines 15-27 of Ouimet has been cited by the Examiner as allegedly teaching the third element of the claimed invention. Ouimet, in this cited passage, teaches "...an effective objective function is constructed by combining the primary objective function with the constraint function multiplied by a weighting factor. The resulting effective objective function depends on the same set of operational variables. The effective objective function is then optimized with respect to each of the operational variables, with the enterprise data providing physical constraints on the optimization...." (col. 2, lines 15-22). Although the term "constraint" is used in this passage, this term, and the steps described above are further explained in the detailed description. Column 7, lines 31-32 provides an equation for the effective objective function, $\Pi_{eff} = \Pi + \psi\phi$, where Π is the primary objective function, and ϕ is the strategic objective function (col. 7, lines 30-38). The strategic objective function is created from strategic constraints, and is also called the constraint function (col. 5, lines 31-43).

The term "constraint" as used in column 2, lines 15-27 refers to the strategic/auxiliary goals, which are used to formulate the constraint function, ϕ. Furthermore, Ouimet discusses combing the constraint function with the primary objective function to form the effective objective function (col. 2, lines 15-27). This teaches away from introducing an embedded constraint into the primary objective function, as there is no modification of the primary objective function, instead incorporating the primary objective function into another effective objective function.

An embedded constraint is used to break the coupling between decision variables that was previously determined (specification page 27, paragraph [0090]). In this way, if there is coupling between decision variables, the planning function can be separated into independent planning functions depending on different ones of the decision variables, by introducing the embedded constraint (*id.*). Ouimet does not teach introducing an embedded constraint to break this coupling. Furthermore, because Ouimet does not teach determining whether there is a coupling, there is no suggestion to modify Ouimet to conform to this element.

Appellant respectfully asserts that that the 35 U.S.C. §103(a) rejection of claim 11 is improper, as neither Elad nor Ouimet teaches of introducing an embedded constraint.

Fourth Element: "following said introducing operation..."

Ouimet does not teach separating the effective objective function into independent functions, and teaches away from this separation by teaching the use of the simulated annealing technique on the full effective objective function (col. 7, lines 40-50). Also, the primary objective function is not independently optimized in Ouimet. Rather, the entirety of the effective objective function is optimized (id.). Furthermore, as Ouimet did not teach the introduction of an embedded constraint into the primary objective function, any optimization of any function in Ouimet cannot satisfy embedded constraints.

Since the elements of Appellant's claim 11 have not been taught by a combination of Elad and Ouimet, and there is no suggestion to modify either or both Elad and Ouimet to conform to the elements of claim 11, an obviousness rejection the rejection of claim 11 is improper. As discussed earlier, Ouimet does not teach to "determin[e] a coupling between decision variables in [a] primary objective function," or "introduce[e] an embedded constraint into [the] primary objective function," as recited in claim 11.. There is no suggestion to modify Ouimet to teach these elements either, as Ouimet's teaching of using simulated annealing to produce a set of results teaches away from reducing the computational complexity of the function by separating the function into individual planning functions. The limitations of determining a

coupling and introducing an embedded constraint are to aid in separating the planning function into individual planning functions, which Ouimet teaches away from.

Also, Appellant respectfully asserts that claims 12-14 are allowable for the reasons discussed above in connection with claim 11, as they depend either directly or indirectly from claim 11.

Independent Claim 17:

The 22 September 2008 Office Action to this application alleges that independent claim 17 is a combination of claims 1 and 5, placing the executing instructions on a computer-readable storage medium. Thus, the Office Action applies the Elad reference to rejecting claim 17 in much the same improper manner as Elad was applied in rejecting claim 1. Appellant believes that claim 17 is allowable for similar reason to those presented above in connection with the First Ground of Rejection for claim 1. In other words, Appellant respectfully asserts that a combination of Elad and Ouimet does not teach the elements of claim 17, nor is there any suggestion to modify either Elad or Ouimet to conform to the elements of this claim. The following argument closely follows the argument made regarding independent claim 1, but are presented again here so that remarks for this Second Ground of Rejection are independent of the remarks for the First Ground of Rejection.

The Office Action alleges that Elad discloses an executable code that instructs a computer to compute decisions for a set of decision variables of a planning model. In particular, this Office Action (page 4) cites a passage in Elad at col. 37, lines 5-9, as a teaching of Appellant's claim 17 limitation of "generating a planning function...depending upon said set of decision variables," with the Examiner reading the Elad reference to "purely numerical model" as being the claimed "planning function." This Office Action (page 4) further cites a passage in Elad at col. 41, lines 34-39, as teaching of Appellant's claim 1 limitation of "separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables." In this passage, the Examiner

reads the Elad reference to "components of the combined objective functions separately" as being the claimed "independent planning functions."

The Office Action (page 4) additionally cites passages in Elad at col. 12, lines 27-35 and col. 40, lines 48-59, as teaching of "independently optimizing each set of said independent planning functions to obtain said decisions for said different ones of said set of decision variables." This Office Action (page 4) also cites a passage in Elad at col. 40, lines 54-59 as teaching of "presenting an outcome of said optimizing operation."

In connection with the rejection of independent claim 17, Appellant contends that the Office Action improperly used prior art references to arrive at an obviousness rejection. As stated in In re Mapelsden 329 F.2d 321, 322, 141 USPQ 30, 32 (C.C.P.A. 1964), and repeated in In re Wood, 599 F.2d 1032, 202 USPQ 171, 174 (C.C.P.A. 1979) (*citing* In re Bozek, 416 F.2d 1385, 1390, 163 USPQ 545, 549-550 (C.C.P.A. 1969):

> "The test for obviousness is not whether the features of one reference may be bodily incorporated into another reference....Rather, we look to see whether combined teachings render the claimed subject matter obvious."

Appellant contends that the combined prior art references do not teach the invention claimed in the application, nor do the combined prior art references make the claimed matter obvious.

Fourth Element: "separating said planning function..."

The Examiner has cited Elad's alleged teaching of creating a "score" that is seen by the user as showing the separation of the planning function into independent planning functions (OA, Paragraph 7b, *citing* col. 41, lines 34-39). However, the "score" is created by using the "components of the combined objective function separately" (col. 41, lines 36-37). Elad further explains the idea of these separate components of the objective function : "that is, the constraint functions alone, and then the objective functions alone" (col. 41, lines 38-39).

Elad does not teach separating a planning function into independent planning functions depending upon different decision variables. The constraint functions and objective functions

used to create the "score" are the same constraint and objective functions provided to the PSE by the PRF for the generation of the combined objective function (col. 36, lines 41-47). These functions provide the relationship between the different decision variables that the user believes affects the combined objective function. For example, one component function can be "return := profit – cost" (col. 15, line 26). As these functions provide a set of basic associations between the different decision variables, they are not independent functions depending upon different variables, rather the function depends upon multiple variables. Thus, when Elad teaches to use the original components to create the combined objective function, it teaches away from separating a planning function into independent planning functions.

This is further affirmed by Elad's teaching that the functions need not be combined (col. 37, lines 30-33). Without the creation of the combined objective function, there is no "planning function" to "separate into independent planning functions," however the constraint and objective functions are still available to create a "score." This shows that the functions used for calculating the "scale" are not derived from the combined objective function, and in fact Elad suggests away from the separation of the combined objective function into independent functions. Also, as discussed earlier, the original component functions provide the relationship between the different decision variables, and so are not all independent functions that depend on different decision variables. The "separating" element of Appellant's independent claim 1 results in individual planning functions that are dependent upon individual decision variables. This separation is not taught by Elad.

Fifth Element: "independently optimizing each..."

The PSE taught by Elad determines the values for a set of decision variables by changing the value of a decision variable and then determining the outcome changes of the result. This process is repeated over multiple iterations to determine the "best" outcome for the problem (Fig. 15 and col. 40, lines 32-40). In other words, Elad teaches optimization through the use of an "exhaustive search" optimization technique. The "weak" method utilizes a modified version of the "exhaustive search" method, where the user can either choose to use the full "exhaustive search", or to control the time that is used to pass through the "weak" method (col. 40, lines 42-

47). The "strong" method uses the gradient search method to determine the results (col. 54, lines 37-39).

For each of these methods, a decision variable is changed, the outcome is determined, and compared to the "current best" to see if the new result is better than the "current best" (col. 40, lines 48-58). When the decision variable is changed, the PSE "uses the Object Hierarchy within the PRF to propagate that change to any other values that need to be changed due to constructs ...." (col. 36, lines 64-68). The dependencies that are implemented are done through the dependency machinery which searches up the object hierarchy to determine which variables must be changed as a result of a first variable being changed (col. 32, lines 6-11). In the instance where one change in the first variable causes multiple changes in the object hierarchy, a propagation algorithm organizes the propagation such that minimal cycles are necessary to ensure all variables are properly changed (col. 32, lines 56-64).

The object hierarchy (shown in Fig. 9a), shows the relationship between the different decision variables. It is a representation of all the variables used in the combined objective function. Elad teaches parsing through the object hierarchy to propagate any changes to any decision variables to create the final values for the decision variables. This teaches away from independently optimizing independent planning functions, instead using the entirety of the combined objective function to determine the values for decision variables.

Elad teaches that the object hierarchy, that defines the decision variable relationships, is created in the PRF, prior to the combined objective function being created by the PRE (col. 16, lines 11-30). Thus, the objective and constraint functions used to create the combined objective function define the object hierarchy. As a result, even if one using the Elad teaching does not combine the objective and constraint functions to form the combined objective function, and proceeds to solve the problem in the PRF, the same dependency and propagation would be executed to provide a result (col. 19, line48 through col. 20, line 20).

Computational complexity is an issue that Elad does acknowledge exists under its teachings (col. 39, lines 20-24), however the methods used by Elad to address this is not to reduce the complexity of the equation to be solved, but rather to limit the values to be tested. Under Elad, the number of cycles used to determine the "global best" values for the decision variables will be very high. To compute the "current best," one cycle of the "weak" method and possibly one cycle of the "strong" method are used (col. 40, lines 49-53). Multiple "current bests" are compared to determine the "global best" values (col. 41, lines 9-13). The computational complexity of the "weak" method is limited by the CPU speed, and requires more time as the number of decision variables increase, and the computational complexity of the "strong" methods are greater than that of the "weak" methods (col. 39, lines 20-24). Multiple cycles of these highly complex and time consuming computations absorb a large number of resources for an enterprise.

By independently optimizing individual planning functions that are derived from a planning function, the computing time and power needed are reduced (page 18, paragraph [0068]). The methods taught by Elad do not suggest a method of reducing the complexity of the computing process, but rather places a limit on the number of cycles that can be used to determine a "current best" if the number of decision variables are above a set threshold (col. 39, lines 12-16).

Since the elements of Appellant's independent claim 17 have not all been taught by Elad or Ouimet or a combination of the two, Appellant respectfully asserts that the 35 U.S.C. §102(b) rejection of claim 17 is improper. In addition, Appellant respectfully asserts that there is no suggestion to modify Elad or Ouimet or both to conform to the elements of independent claim 17. As discussed earlier, Elad's object hierarchy used to propagate changes in decision variables teaches away from creating independent planning functions to optimize different ones of decision variables. Also, teaching the use of original objective and constraint functions to create a "score" to rate the results, and not separating the combined objective function in order to create independent functions teaches away from separating a planning function into independent planning functions depending upon different ones of decision variables. Ouimet uses the

simulated annealing technique to determine the ultimate result, which also teaches away from creating independent planning functions to optimize the decision variables.

Also, Appellant respectfully asserts that claims 18-20 are allowable for the reasons discussed above in connection with claim 17, as they depend either directly or indirectly from claim 17.

Independent Claim 21:

Regarding claim 21, the 22 September 2008 Office Action to this application stated that the claim was rejected. Claim 21 was alleged to be equivalent to claims 1 and 5, and the rejection of independent claim 21 was combined with the rejection of independent claim 17. In fact, claim 21 is more similar to claims 1 and 11. The following arguments provide distinctions between this invention and those taught by Elad and Ouimet. The arguments presented in this section parallel arguments provided earlier in this brief.

The Office Action to this application alleges that Elad discloses a method for computing decisions. In particular, this Office Action (page 4) cites a passage in Elad at col. 37, lines 5-9, as a teaching of Appellant's claim 1 limitation of "generating a planning function...depending upon said set of decision variables," with the Examiner reading the Elad reference to "purely numerical model" as being the claimed "planning function." This Office Action (page 4) further cites a passage in Elad at col. 41, lines 34-39, as teaching of Appellant's claim 1 limitation of "separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables." In this passage, the Examiner reads the Elad reference to "components of the combined objective functions separately" as being the claimed "independent planning functions."

The Office Action (page 4) additionally cites passages in Elad at col. 12, lines 27-35 and col. 40, lines 48-59, as teaching of "independently optimizing each set of said independent planning functions to obtain said decisions for said different ones of said set of decision

variables." This Office Action (page 4) also cites a passage in Elad at col. 40, lines 54-59 as teaching of "presenting an outcome of said optimizing operation."

This Office Action (page 5) proceeds to cite passages in Elad at col. 36, lines 41-46 of Elad as teaching "defining a primary objective function...including said set of decision variables." This Office Action (pages 5-6) further alleges that in the same field of invention, Ouimet teaches defining a strategic objective function including a subset of decision variables and generating operation incorporates said primary objective function and strategic objective function. This Office Action (page 5) cites a passage in Ouimet at col. 4, lines 7-8 as providing the alleged teaching of defining a strategic objective function including a subset of decision variables and generating operation incorporates said primary objective function and strategic objective function, i.e., a strategic objective function is defined and used along with a primary objective function to create a planning function.

This Office Action (pages 5-6) concludes that it would have been obvious to one of ordinary skill in the art, having the teachings of Elad and Ouimet at the time the invention was made, to have combined defining a strategic objective function including a subset of decision variables and generating operation incorporates said primary objective function and strategic objective function of Ouimet with the method as taught by Elad. This Office Action asserts that one would have been motivated to make such a combination because the invention in this application is merely a combination of old elements, and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

Ouimet teaches a method for controlled optimization of enterprise planning models (title). In particular, Ouimet teaches defining primary and secondary goals, creating an effective objective function, and optimizing the effective objective function (col. 2, lines 6-22).

In connection with the rejection of independent claim 21, Appellant contends that the Office Action improperly used prior art references to arrive at an obviousness rejection. As

stated in In re Mapelsden 329 F.2d 321, 322, 141 USPQ 30, 32 (C.C.P.A. 1964), and repeated in In re Wood, 599 F.2d 1032, 202 USPQ 171, 174 (C.C.P.A. 1979) (*citing* In re Bozek, 416 F.2d 1385, 1390, 163 USPQ 545, 549-550 (C.C.P.A. 1969):

> "The test for obviousness is not whether the features of one reference may be bodily incorporated into another reference....Rather, we look to see whether combined teachings render the claimed subject matter obvious."

Appellant contends that the combined prior art references do not teach the invention claimed in the application, nor do the combined prior art references make the claimed matter obvious.

Third Element: "determining a coupling..."

Ouimet teaches representing a primary goal by a primary objective function, where the primary objective function depends on a set of operational variables (col. 2, lines 6-8). The Examiner alleges that the passage in Ouimet stating "[e]ach of the operational variables represents a single operational decision that the user seeks to optimize in order to reach the primary goal" teaches the element of "determining a coupling between said decision variables in said primary objective function" of the claimed invention. Appellant respectfully disagrees, as Ouimet does not teach determining a coupling between decision variables. Rather, it teaches that there is a primary objective function which depends upon a set of decision variables. Primary objectives and strategic objectives are defined, combined into an effective objective function, and solved through simulated annealing (col. 7, lines 9-50).

A coupling need only be determined from the combined function when the function is to be separated into independent functions, a limitation stated in claim 1. This is done so that the coupling can be later broken and the combined function can be separated into individual functions that depend on individual variables (page 27, paragraph [0089]). This issue is not taught by Ouimet, and there is no suggestion to modify Ouimet to do this, as Ouimet does not separate the effective objective function into independent functions.

Appellant respectfully asserts that that the 35 U.S.C. §103(a) rejection of claim 21 is improper, as neither Elad nor Ouimet teaches of determining a coupling element.

Fourth Element: "introducing an embedded constraint..."

The third element of claim 11 recites "introducing an embedded constraint into said primary objective function." Column 2, lines 15-27 of Ouimet has been cited by the Examiner as allegedly teaching the third element of the claimed invention. Ouimet, in this cited passage, teaches "...an effective objective function is constructed by combining the primary objective function with the constraint function multiplied by a weighting factor. The resulting effective objective function depends on the same set of operational variables. The effective objective function is then optimized with respect to each of the operational variables, with the enterprise data providing physical constraints on the optimization...." (col. 2, lines 15-22). Although the term "constraint" is used in this passage, this term, and the steps described above are further explained in the detailed description. Column 7, lines 31-32 provides an equation for the effective objective function, $\Pi_{eff} = \Pi + \psi\phi$, where Π is the primary objective function, and ϕ is the strategic objective function (col. 7, lines 30-38). The strategic objective function is created from strategic constraints, and is also called the constraint function (col. 5, lines 31-43).

The term "constraint" as used in column 2, lines 15-27 refers to the strategic/auxiliary goals, which are used to formulate the constraint function, ϕ. Furthermore, Ouimet discusses combing the constraint function with the primary objective function to form the effective objective function (col. 2, lines 15-27). This teaches away from introducing an embedded constraint into the primary objective function, as there is no modification of the primary objective function, instead incorporating the primary objective function into another effective objective function.

An embedded constraint is used to break the coupling between decision variables that was previously determined (specification page 27, paragraph [0090]). In this way, if there is coupling between decision variables, the planning function can be separated into independent planning functions depending on different ones of the decision variables, by introducing the embedded constraint (*id.*). Ouimet does not teach introducing an embedded constraint to break

this coupling. Furthermore, because Ouimet does not teach determining whether there is a coupling, there is no suggestion to modify Ouimet to conform to this element.

Appellant respectfully asserts that that the 35 U.S.C. §103(a) rejection of claim 21 is improper, as neither Elad nor Ouimet teaches of introducing an embedded constraint.

Fifth Element: "separating said planning function..."

The Examiner has cited Elad's alleged teaching of creating a "score" that is seen by the user as showing the separation of the planning function into independent planning functions (OA, Paragraph 7b, *citing* col. 41, lines 34-39). However, the "score" is created by using the "components of the combined objective function separately" (col. 41, lines 36-37). Elad further explains the idea of these separate components of the objective function : "that is, the constraint functions alone, and then the objective functions alone" (col. 41, lines 38-39).

Elad does not teach separating a planning function into independent planning functions depending upon different decision variables. The constraint functions and objective functions used to create the "score" are the same constraint and objective functions provided to the PSE by the PRF for the generation of the combined objective function (col. 36, lines 41-47). These functions provide the relationship between the different decision variables that the user believes affects the combined objective function. For example, one component function can be "return := profit – cost" (col. 15, line 26). As these functions provide a set of basic associations between the different decision variables, they are not independent functions depending upon different variables, rather the function depends upon multiple variables. Thus, when Elad teaches to use the original components to create the combined objective function, it teaches away from separating a planning function into independent planning functions.

This is further affirmed by Elad's teaching that the functions need not be combined (col. 37, lines 30-33). Without the creation of the combined objective function, there is no "planning function" to "separate into independent planning functions," however the constraint and objective functions are still available to create a "score." This shows that the functions used for

calculating the "scale" are not derived from the combined objective function, and in fact Elad suggests away from the separation of the combined objective function into independent functions. Also, as discussed earlier, the original component functions provide the relationship between the different decision variables, and so are not all independent functions that depend on different decision variables. The "separating" element of Appellant's independent claim 21 results in individual planning functions that are dependent upon individual decision variables. This separation is not taught by Elad.

Ouimet teaches creating an effective objective function by combining the primary and strategic objective functions (col. 7, lines 30-32), however it does not teach separating the effective objective function into independent functions in order to optimize them. Instead, Ouimet teaches to use a simulated annealing technique to determine the optimum decision set using the full effective objective function (col. 7, lines 42-45). This technique is specifically used due to many factors including the large number of variables that are involved in the development of the optimized solution. This technique, and thus Ouimet, teaches away from separating a planning function into independent planning functions. Furthermore, as Ouimet did not teach the introduction of an embedded constraint independent planning functions cannot include an embedded constraint.

Sixth Element: "independently optimizing each..."

The PSE taught by Elad determines the values for a set of decision variables by changing the value of a decision variable and then determining the outcome changes of the result. This process is repeated over multiple iterations to determine the "best" outcome for the problem (Fig. 15 and col. 40, lines 32-40). In other words, Elad teaches optimization through the use of an "exhaustive search" optimization technique. The "weak" method utilizes a modified version of the "exhaustive search" method, where the user can either choose to use the full "exhaustive search", or to control the time that is used to pass through the "weak" method (col. 40, lines 42-47). The "strong" method uses the gradient search method to determine the results (col. 54, lines 37-39).

For each of these methods, a decision variable is changed, the outcome is determined, and compared to the "current best" to see if the new result is better than the "current best" (col. 40, lines 48-58). When the decision variable is changed, the PSE "uses the Object Hierarchy within the PRF to propagate that change to any other values that need to be changed due to constructs ...." (col. 36, lines 64-68). The dependencies that are implemented are done through the dependency machinery which searches up the object hierarchy to determine which variables must be changed as a result of a first variable being changed (col. 32, lines 6-11). In the instance where one change in the first variable causes multiple changes in the object hierarchy, a propagation algorithm organizes the propagation such that minimal cycles are necessary to ensure all variables are properly changed (col. 32, lines 56-64).

The object hierarchy (shown in Fig. 9a), shows the relationship between the different decision variables. It is a representation of all the variables used in the combined objective function. Elad teaches parsing through the object hierarchy to propagate any changes to any decision variables to create the final values for the decision variables. This teaches away from independently optimizing independent planning functions, instead using the entirety of the combined objective function to determine the values for decision variables.

Elad teaches that the object hierarchy, that defines the decision variable relationships, is created in the PRF, prior to the combined objective function being created by the PRE (col. 16, lines 11-30). Thus, the objective and constraint functions used to create the combined objective function define the object hierarchy. As a result, even if one using the Elad teaching does not combine the objective and constraint functions to form the combined objective function, and proceeds to solve the problem in the PRF, the same dependency and propagation would be executed to provide a result (col. 19, line48 through col. 20, line 20).

Computational complexity is an issue that Elad does acknowledge exists under its teachings (col. 39, lines 20-24), however the methods used by Elad to address this is not to reduce the complexity of the equation to be solved, but rather to limit the values to be tested. Under Elad, the number of cycles used to determine the "global best" values for the decision

variables will be very high. To compute the "current best," one cycle of the "weak" method and possibly one cycle of the "strong" method are used (col. 40, lines 49-53). Multiple "current bests" are compared to determine the "global best" values (col. 41, lines 9-13). The computational complexity of the "weak" method is limited by the CPU speed, and requires more time as the number of decision variables increase, and the computational complexity of the "strong" methods are greater than that of the "weak" methods (col. 39, lines 20-24). Multiple cycles of these highly complex and time consuming computations absorb a large number of resources for an enterprise.

By independently optimizing individual planning functions that are derived from a planning function, the computing time and power needed are reduced (page 18, paragraph [0068]). The methods taught by Elad do not suggest a method of reducing the complexity of the computing process, but rather places a limit on the number of cycles that can be used to determine a "current best" if the number of decision variables are above a set threshold (col. 39, lines 12-16).

Ouimet teaches using the simulated annealing technique for to address the computational complexity issue that arises with such types of functions (col. 7, lines 42-45). The method of annealing the full effective objective function teaches away from independently optimizing independent planning functions. Also, the primary objective function is not independently optimized in Ouimet, rather the entirety of the effective objective function is optimized (col. 7, lines 40-50). Furthermore, as Ouimet did not teach the introduction of an embedded constraint into the primary objective function, any optimization of any function in Ouimet cannot satisfy embedded constraints.

Since Appellant's independent claim 21 has not been taught by a combination of Elad and Ouimet, Appellant respectfully asserts that the 35 U.S.C. §103(a) rejection of claim 21 is improper. In addition, Appellant respectfully asserts that there is no suggestion to modify Elad or Ouimet to conform to the elements of independent claim 21. As discussed earlier, both Elad's object hierarchy used to propagate changes in decision variables and Ouimet's simulated

annealing technique teach away from creating independent planning functions to optimize different ones of decision variables. Also, teaching the use of original objective and constraint functions to create a "score" to rate the results, and not separating the combined objective function in order to create independent functions teaches away from separating a planning function into independent planning functions depending upon different ones of decision variables.

Also, Appellant respectfully asserts that claims 22 and 23 are allowable for the reasons discussed above in connection with claim 21, as they depend either directly or indirectly from claim 21.

Grounds of Rejection – Claims 12-14, and 23

Dependent Claims 12 and 23:

Regarding claims 12 and 23, the 22 September 2008 Office Action to this application alleges that Ouimet and Elad teaches the method as claimed in claim 11, and acknowledges that Ouimet and Elad do not explicitly teach the introduction of additional constraint factors or variables for the constraint function. However, the Office Action alleges that Dietrich teaches introducing additional decision variables that correspond to different products (OA, Paragraph 22, *citing* col. 10, line 66 to col. 11, line 3). Appellant respectfully asserts that the combination of Elad, Ouimet and Dietrich does not teach the claimed invention, nor is there a suggestion to modify either Elad, Ouimet, or Dietrich to obtain the claimed invention.

The Examiner equates the "inclu[sion] of an embedded constraint variable" as recited in claims 12 and 23, to introducing additional decision variables that correspond to different products (OA, Paragraph 22). As discussed earlier regarding claims 11 and 21, the embedded constraint is used to break couplings between decision variables (specification page 27, paragraph [0090]). The embedded constraint variable is not an additional decision variable that corresponds to different products, but rather is used to remove coupling between the decision variables (specification page 6, paragraph [87]). It would not have been obvious to one having

ordinary skill in the art to modify Ouimet or Elad with methods provided in Dietrich, as none of Ouimet, Elad nor Dietrich address potential coupling between decision variables. This is because none of these three prior art references determine whether there is a coupling between decision variables, as none of them separate a planning function into independent planning functions depending upon different ones of the decision variables.

Since the elements of Appellant's claims 12 and 23 have not been taught by a combination of Elad, Ouimet and Dietrich, and there is no suggestion to modify any of Elad, Ouimet, or Dietrich to conform to the elements of claims 12 and 23, an obviousness rejection the rejection of these claims is improper. As discussed earlier, the embedded constraint variable in the claimed invention is not an additional decision variable that corresponds to additional products, and therefore Dietrich does not teach optimization methods that modify Ouimet and Elad to result in the claimed invention. Furthermore, there is no motivation to modify any of the three prior art references to conform to the claimed invention, as none of the three teach to separate a function into independent functions, and so there is no need to remove couplings between decision variables in any of the prior art references.

Also, Appellant respectfully asserts that claims 13-14 are allowable for the reasons discussed above in connection with claim 12, as they depend either directly or indirectly from claim 12.

Appellant believes that the arguments above fully respond to every outstanding ground of rejection and that the contested claims should be found allowable.

Respectfully submitted,

Lowell W. Gresham

Lowell W. Gresham
Attorney for Appellant
Reg. No. 31,165

Lowell W. Gresham
5727 North Seventh Street
Suite 409
Phoenix, AZ 85014
(602) 274-6996

Appendix A -- Claims on Appeal

This Appendix is ten (10) pages, including this cover page, and contains a clean double-spaced copy of the claims on appeal.

Claim 1: In a planning model characterizing an enterprise, a method of computing decisions in a computing environment for a set of decision variables comprising:

generating a planning function describing said planning model, said planning function depending upon said set of decision variables;

separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables;

independently optimizing each of said independent planning functions in said computing environment to obtain said decisions for said different ones of said set of decision variables; and

presenting an outcome of said optimizing operation at an output section of said computing environment, said outcome indicating said obtained decisions.

Claim 2: A method as claimed in claim 1 wherein said generating operation defines said planning function to be a non-linear function of at least one of said decision variables.

Claim 3: A method as claimed in claim 2 wherein said non-linear function is continuous.

Claim 4: A method as claimed in claim 2 wherein said non-linear function is discontinuous.

Claim 5: A method as claimed in claim 1 wherein:

said planning model incorporates a primary objective and a strategic objective of said enterprise;

said method further comprises:

defining a primary objective function describing said primary objective, said primary objective function including said set of decision variables; and

defining a strategic objective function describing said strategic objective, said strategic objective function including a subset of said decision variables; and

said generating operation incorporates said primary objective function and said strategic objective function within said planning function.

Claim 6: A method as claimed in claim 5 further comprising:

specifying a plurality of values for a strategic factor, said strategic factor being configured to adjust an influence that said strategic objective has on said planning model; and

coupling said strategic objective function with said strategic factor.

Claim 7: A method as claimed in claim 6 wherein said independently optimizing operation optimizes said independent planning functions for each of said values of said strategic factor.

Claim 8: A method as claimed in 5 wherein:

said strategic objective is a first strategic objective;

said method further comprises defining a second strategic objective function describing a second strategic objective of said enterprise, said second strategic objective function including a second subset of said decision variables;

said generating operation further incorporates said second strategic objective function within said planning function; and

said presenting operation comprises providing an interaction of said primary objective function, said first strategic objective function, and said second strategic objective function.

Claim 9: A method as claimed in claim 8 further comprising:

specifying a plurality of values for a second strategic factor, said second strategic factor being configured to adjust an influence that said second strategic objective has on said strategic planning model;

coupling said second strategic objective function with said second strategic factor; and

said optimizing operation further includes independently optimizing said planning function for each of said second values of said second strategic factor.

Claim 10: A method as claimed in claim 1 wherein said independently optimizing operation comprises selecting an optimization algorithm from a group comprising a closed form solution, a one dimensional maximization of continuous decision variables, a one dimensional maximization of discrete variables, and a general multidimensional method.

Claim 11: A method as claimed in claim 1 wherein said planning model incorporates a primary objective of said enterprise, and said method further comprises:

defining a primary objective function describing said primary objective, said primary objective function including said set of decision variables, and said generating operation incorporating said primary objective function within said planning function;

determining a coupling between said decision variables in said primary objective function;

introducing an embedded constraint into said primary objective function; and

following said introducing operation, performing said independently optimizing operation to optimize said primary objective function while concurrently satisfying said embedded constraint.

Claim 12: A method as claimed in claim 11 wherein:

said introducing operation comprises:

including an embedded constraint variable for said embedded constraint in said primary objective function; and

defining an embedded constraint function to include said embedded constraint variable;

said generating operation comprises constructing said planning function by combining said primary objective function and said embedded constraint function; and

said independently optimizing operation comprises providing said decisions which optimize said primary objective function while concurrently satisfying said embedded constraint function.

Claim 13: A method as claimed in 12 further comprising:

specifying a plurality of values for a constraint factor, said constraint factor being configured to adjust an influence that said embedded constraint has on said planning model; and

coupling said embedded constraint function with said constraint factor.

Claim 14: A method as claimed in claim 13 wherein said independently optimizing operation optimizes said independent planning functions for each of said values of said constraint factor.

Claim 15: A method as claimed in claim 1 wherein said presenting operation comprises providing said decisions for said different ones of said set of decision variables that optimize said each of said independent planning functions.

Claim 16: A method as claimed in claim 1 wherein said presenting operation comprises providing a plurality of scenario points, each of said plurality of scenario points being associated with said decisions for said decision variables that optimize said each of said independent planning functions.

Claim 17: A computer-readable storage medium containing code executable by a computer, said code instructing said computer to compute decisions for a set of decision variables of a planning model characterizing an enterprise, said planning model incorporating a primary objective and a strategic objective of said enterprise, and said code instructing said computer to perform operations comprising:

defining a primary objective function describing said primary objective, said primary objective function including said set of decision variables;

defining a strategic objective function describing said strategic objective, said strategic objective function including a subset of said decision variables;

generating a planning function describing said planning model, said generating operation incorporating said primary objective function and said strategic objective function within said planning function, and said planning function including a non-linear function of one of said decision variables;

separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables;

independently optimizing each of said independent planning functions in said computer to obtain said decisions for said different ones of said set of decision variables; and

presenting an outcome of said optimizing operation at an output section of said computer, said outcome indicating said obtained decisions.

Claim 18: A computer-readable storage medium as claimed in claim 17 wherein said executable code identifies selection of an optimization algorithm from a group comprising a closed form solution, a one dimensional maximization of continuous decision variables, a one dimensional maximization of discrete variables, and a general multidimensional method.

Claim 19: A computer-readable storage medium as claimed in claim 17 wherein said executable code instructs said computer to perform further operations comprising:

specifying a plurality of values for a strategic factor, said strategic factor being configured to adjust an influence that said strategic objective has on said planning model;

coupling said strategic objective function with said strategic factor; and

optimizing said independent planning functions for each of said values of said strategic factor.

Claim 20: A computer-readable storage medium as claimed in claim 17 wherein said strategic objective is a first strategic objective, and said executable code instructs said computer to perform further operations comprising:

defining a second strategic objective function describing a second strategic objective of said enterprise, said second strategic objective function including a second subset of said decision variables;

incorporating said second strategic objective function within said planning function; and

providing an interaction of said primary objective function, said first strategic objective function, and said second strategic objective function.

Claim 21: A method of computing decisions in a computing environment for a set of decision variables of a planning model characterizing an enterprise, said planning model incorporating a primary objective of said enterprise, said method comprising:

defining a primary objective function describing said primary objective, said primary objective function including said set of decision variables;

generating a planning function describing said planning model, said planning function including said primary objective function, and said planning function depending upon said set of decision variables;

determining a coupling between said decision variables in said primary objective function;

introducing an embedded constraint into said primary objective function;

separating said planning function into independent planning functions, each of said independent planning functions depending upon different ones of said set of decision variables, said independent planning functions including said embedded constraint;

independently optimizing each of said independent planning functions in said computing environment to obtain said decisions for said different ones of said set of decision variables, said optimizing operation optimizing said primary objective function while concurrently satisfying said embedded constraint; and

presenting at an output section of said computing environment said decisions for said different ones of said set of decision variables that optimize said each of said independent planning functions.

Claim 22: A method as claimed in claim 21 wherein said generating operation defines said planning function to include a non-linear function of at least one of said decision variables.

Claim 23: A method as claimed in claim 21 wherein:

said introducing operation comprises:

including an embedded constraint variable for said embedded constraint in said primary objective function; and

defining a embedded constraint function to include said embedded constraint variable;

said generating operation comprises constructing said planning function by combining said primary objective function and said embedded constraint function; and

said independently optimizing operation comprises providing said decisions which optimize said primary objective function while concurrently satisfying said embedded constraint function.

Appendix B -- Evidence

NONE

Appendix C – Related Proceedings Appendix

NONE